PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference AP101505/TA	**FOR FURTHER ACTION** See Form PCT/IPEA/416	
International application No. PCT/FI 2003/000683	International filing date *(day/month/year)* 19-09-2003	Priority date *(day/month/year)* 30-09-2002
International Patent Classification (IPC) or national classification and IPC G01N21/37, G01J5/00		
Applicant NOVELTECH SOLUTIONS LTD ET AL		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 10 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of _____ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☒ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☒ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☒ Box No. VI Certain documents cited
   - ☒ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
21-04-2004	21-12-2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Anna Lundqvist /LR Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/FI 2003/000683

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))
☐ publication of the international application (under Rule 12.4)
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☒ the international application as originally filed/furnished

☐ the description:

pages _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ the claims:

pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ the drawings:

pages _____ as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/figs _____
☐ the sequence listing *(specify)*: _____
☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PR[redacted]MINARY REPORT ON PATENTABILITY

International application No.
[redacted]T/FI 2003/000683

Box No. II Priority

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

   ☐ copy of the earlier application whose priority has been claimed (Rule 66.7(a)).

   ☐ translation of the earlier application whose priority has been claimed (Rule 66.7(b)).

2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rule 64.1). Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

The priority claimed is considered valid. Therefore, document US 2003173502 A1 remains as a P, X-document.

INTERNATIONAL PR[redacted]INARY REPORT ON PATENTABILITY

International application No.
[redacted]T/FI 2003/000683

Box No. IV Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

☐ restricted the claims.

☐ paid additional fees.

☐ paid additional fees under protest.

☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is:

☐ complied with.

☒ not complied with for the following reasons:

The present application relates to 2 different inventions. The separate inventions are:

Invention 1: Claims 1-11 relate to a photo-acoustic detector including a membrane, movable in response to the movement of the gas investigated. The movement of the membrane is measured in an optical way, illuminating the membrane with a light beam and detecting the reflected light.

Invention 2: Claims 12-13 relate to a method for optimizing the amplitude of the membrane movement applying a certain optimization equation.

The special technical feature of invention 1 is to provide a contactless measurement of the membrane movement as optical angular and/or translatory measurement.

The special technical feature of invention 2 is to provide an optimized membrane in a sensor for a photo-acoustic detector.

.../...

4. Consequently, this report has been established in respect of the following parts of the international application:

☒ all parts.

☐ the parts relating to claims Nos. _____

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

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Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	5-8	YES
	Claims	1-4, 9-11	NO
Inventive step (IS)	Claims		YES
	Claims	5-8	NO
Industrial applicability (IA)	Claims	1-13	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The application relates to a photo-acoustic detector containing a moveable sensor arranged between two chambers and a detector assembly to detect light reflected from the sensor movement as optical angular and/or translatory measurement.

Reference is made to the following documents:
D1: EP 1239698 A1
D2: US 6210331 B1
D3: "High sensitivity optical microphone for photoacoustics", M. H. de Paula et al., Rev.Sci.Instrum. 63(6), June 1992, 1992 American Institute of Physics.
D4: "Optical microphone for photoacoustic spectroscopy", M. H. de Paula et al., J. Appl. Phys. 64(7), 1 October 1988, 1988 American Institute of Physics.

Document D1 describes an optical acoustoelectric transducer for converting vibration displacement of a vibrating board into an electric signal by using light. The board's reflection angle is changed by vibrations due to reception of a sound wave. Accordingly, the vibration displacement of the vibrating board can be detected by detecting a change in the received light amount of the concentrically placed light-receiving elements. See [0048], [0049] and abstract.

Document D2 relates to an ultrasonic imaging system which incorporates an imaging device utilizing confocal acoustic focusing of ultrasonic transducers together with apparatus for moving points of focus of the transducers to scan a volume to be imaged and gather data as to the acoustic reflectivity of matter within the volume. One embodiment of the invention is

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

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Box No. VI Certain documents cited

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date *(day/month/year)*	Filing date *(day/month/year)*	Priority date (valid claim) *(day/month/year)*
US 2003173502 A1 P,X	18-09-2003	13-03-2002	

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure *(day/month/year)*	Date of written disclosure referring to non-written disclosure *(day/month/year)*

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

In the list of literature references there is an error in reference [3]. The volume should be 63.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box IV

The single general concept of the present application is the contactless measurement of a membrane movement using optical means.

However, this concept is well-known from the prior art since EP1239698 discloses an optical acousto-electric transducer. The transducer includes a device radiating light toward a vibrating board at a predetermined angle from the light-emitting device and detection means to detect the reflected light. The angle of the reflected light is changed by vibration of the vibrating board due to reception of a sound wave. The vibration displacement of the vibrating board can be detected by detecting a change in the received light. Also what is mentioned in references [2] and [3], disclosed in the application, contains information on optical microphones.

Since the concept is known, it cannot be inventive. Hence, there is no single general inventive concept in the sense of Rule 13.1 PCT.

No other features can be distinguished which can be considered as same or corresponding special technical features in the sense of Rule 13.2 PCT.

Thus, the application lacks unity of invention.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Box V

to sense acoustic signals passing through the pin-hole of the confocal acoustic focusing system. A thin metallized synthetic plastic membrane will provide the cleared properties and vibrate in sympathy with acoustic waves traversing the pin-hole. To monitor vibration of the membrane is to monitor changes in the length of the reflected light path by means of optical interferometry. The optical interferometer has a laser as a source of coherent light. A light beam from the laser is split by a beam splitter, conveniently a half-silvered mirror, which splits the beam into two portions, the first of which is impingent on a reflective surface of the membrane, and the second on a mirror, the reflected beams being recombined by a beam combiner, conveniently again a half-silvered mirror, into a single beam impingent on an optical sensor. See column 5, lines 15-58.

Document D3 discloses an optical gas-phase microphone consisting of a photo-acoustic cell and a reflective pellicle. One measures the displacement of the light spot from the laser. See page 3490, lines 10-34.

Document D4 describes an optical microphone for photo-acoustic spectroscopy. A laser beam strikes on a reflecting pellicle and is detected by a photodiode.

The optical acousto-electric transducer described in document D1 is considered to be the most relevant prior art relating to the photo-acoustic detector described in claim 1 and the method for measuring the movement of a membrane in a photoacoustic detector described in claim 11. The technique described in claims 1 and 11 does not differ from the technique in D1 or from what is mentioned in documents D3 and D4.
Also what is described in claims 2-4 and 8 is mentioned in documents D1, D3 and D4. Therefore, the technique described in claims 1-4, 9 and 11 lacks novelty.

The ultrasonic imaging system described in D2 is considered to be the most relevant prior art relating to the measuring system described in claim 10. What is mentioned in claim 10 does not differ from the technique in D1. Therefore, the measuring system in claim 10 lacks novelty.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of: Box V

The optical acoustoelectric transducer described in document D1 is considered to be the most relevant prior art. What is mentioned in claims 5-8 differs from this technique in that it includes optical lenses, mirrors and beam splitters for light transporting. A person skilled in the art facing the problem to direct light knows from what is mentioned in D2 to use beam splitters, lenses and mirrors. If the person skilled in the art modifies the closest prior art according to the instructions in D2, he will reach the invention as defined in claims 5-8. Since the prior art belongs to the same technical field and solves the same problem with the same construction, it is considered obvious for a person skilled in the art to apply this technique. The invention according to claims 5-8 is therefore considered to lack an inventive step.

The method of optimization of a photo-acoustic detector described in claim 12 and 13 is considered to be novel and to involve an inventive step.

The invention is industrially applicable.